THE SYMBOL FONT DBNSYMB

DROR BAR-NATAN

Abstract. This is the user manual for the symbol font `dbnsymb`.

This document is available electronically at `http://www.math.toronto.edu/~drorbn/projects/dbnsymb/`.

Contents

1. Introduction

Over the last few years I occasionaly needed new symbols for the papers I was writing: overcrossings (⤱), undercrossings (⤲), pentagons (⬠), whatever. I've always settled for partial and ad-hoc solutions — drawing little LaTeX figures, combining existing symbols, etc. But if the AMS can have its own symbol package (`amssymb.sty`), why can't I have one too, with symbols to my liking, which are placed and scaled just like TeX's own?

`dbnsymb` is an attempt to create this personal font. I plan to use it in my own papers and ship it with those when I ship them out, just like I ship macros and figures. I plan to continue adding symbols to it as needed (or as requested by others) and to continue improving the existing symbols in it.

This document documents `dbnsymb`, it's usage, and how it can be modified. If you also need wheels (¤) or double points (⤫) or anything else that's in, feel free to use it yourself. Finally, if you need your own symbols too, you are welcome to download `dbnsymb` and use it as a basis for your own modifications. I will also be happy to add symbols to `dbnsymb` for you, provided they are likely to be of interest for me and/or others with similar research interests.

2. Usage

To use `dbnsymb`, you need to have the files `dbnsymb.mf` and `dbnsymb.sty` somewhere where LaTeX would see them — your current working directory or in any other place where LaTeX

Date: This Edition: Mar. 2, 2020; Revision History: Section 7.

looks. These files can be downloaded by clicking on their names on the html version of this manual, which is available at http://www.math.toronto.edu/˜drorbn/projects/dbnsymb/.

This done, you should include the package `dbnsymb.sty` in your document, cross your fingers, and hope for the best.

3. Example

If all goes well and the files `dbnsymb.mf` and `dbnsymb.sty` really are in LaTeX's sight, the following example file should produce the output that follows it:

```
\documentclass{article}
\usepackage{dbnsymb}
\begin{document}
Here's a famous formula:
\[ V(\doublepoint) := V(\overcrossing) - V(\undercrossing), \]
and here's another way of writing it, with the new symbols as
superscripts:
\[ V(K^\doublepoint) := V(K^\overcrossing) - V(K^\undercrossing). \]
\end{document}
```

Here's a famous formula:

$$V(\doublepoint) := V(\overcrossing) - V(\undercrossing),$$

and here's another way of writing it, with the new symbols as superscripts:

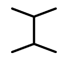
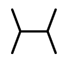
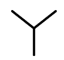
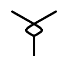
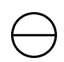
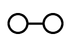
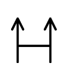
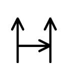
$$V(K^\doublepoint) := V(K^\overcrossing) - V(K^\undercrossing).$$

A more extensive example is this manual page itself. The source files are available from the html version of this manual, at http://www.math.toronto.edu/˜drorbn/projects/dbnsymb/.

4. The symbol table

Symbol	LaTeXcommand	Usage example
$\doublepoint$	`\doublepoint`	$V(\doublepoint)$
$\overcrossing$	`\overcrossing`	$V(\overcrossing)$
$\undercrossing$	`\undercrossing`	$V(\undercrossing)$
$\virtualcrossing$	`\virtualcrossing`	Virtual crossings ($\virtualcrossing$) are endemic to quantum algebra
$\semivirtualover$	`\semivirtualover`	Semi-virtuals are differences: $\semivirtualover \leftrightarrow \overcrossing - \virtualcrossing$.
$\semivirtualunder$	`\semivirtualunder`	$\doublepoint \leftrightarrow \semivirtualover - \semivirtualunder$.
$\slashoverback$	`\slashoverback`	$\langle\slashoverback\rangle$
$\svslashoverback$	`\svslashoverback`	$\svslashoverback = \slashoverback - \times$

Symbol	LaTeXcommand	Usage example
$\backoverslash$	\backoverslash	$\langle\backoverslash\rangle$
$\svbackoverslash$	\svbackoverslash	$\svbackoverslash = \backoverslash - \crossing$
$\Associator$	\Associator	$\Associator$ and $\backoverslash$ generate parenthesized tangles.
$\righttwist$	\righttwist	"$\righttwist$" denotes a ribbon with a right-handed twist
$\lefttwist$	\lefttwist	"$\lefttwist$" denotes a ribbon with a left-handed twist
$\MobiusSymbol$	\MobiusSymbol	"$\MobiusSymbol$" denotes the trivially embedded Möbius band
$\crossing$	\crossing	
$\smoothing$	\smoothing	$zC(\smoothing)$
$\upupsmoothing$	\upupsmoothing	The Conway relation $C(\overcrossing) - C(\undercrossing) = zC(\upupsmoothing)$
$\hsmoothing$	\hsmoothing	The A_1 relation: $\HSaddleSymbol = 2\hbar(\hsmoothing - \crossing)$
$\HSaddleSymbol$	\HSaddleSymbol	The cobordism $\HSaddleSymbol : \smoothing \to \hsmoothing$
$\ISaddleSymbol$	\ISaddleSymbol	The cobordism $\ISaddleSymbol : \hsmoothing \to \smoothing$
$\fourinwheel$	\fourinwheel	The cobordism $\fourinwheel : \bigcirc \to \emptyset$
$\twowheel$	\twowheel	$\Omega = 1 + \frac{\twowheel}{48}$
$\fourwheel$	\fourwheel	The wheeled Kontsevich integral $Z^{\fourwheel}(K)$
$\pentagon$	\pentagon	The $\pentagon_m$ equation
$\hexagon$	\hexagon	The $\hexagon_\pm$ relations
$\tetrahedron$	\tetrahedron	$\tetrahedron$ is $6j$
$\isolatedchord$	\isolatedchord	The framing correction $e^{f\frac{\isolatedchord}{2}}$
$\righttrefoil$	\righttrefoil	$J(\righttrefoil) = -t^4 + t^3 + t$
$\lefttrefoil$	\lefttrefoil	$J(\lefttrefoil) = -t^{-4} + t^{-3} + t^{-1}$
$\OpenHopfUp$	\OpenHopfUp	The open Hopf link $\OpenHopfUp^y_x$
$\OpenHopf$	\OpenHopf	The undirected open Hopf link $\OpenHopf^y_x$
$\HopfLink$	\HopfLink	$Z^{\fourwheel}(\HopfLink) = \langle\Omega, \Omega\rangle \exp {}^x\frown^y$
$\botright$	\botright	$\sigma_y Z(\OpenHopfUp^y_x) = \Omega_y \exp_\#(\botright^y_x)$

Symbol	LaTeX command	Usage example
	`\SGraph`	The STU relation: $\SGraph = \TGraph - \UGraph$
	`\TGraph`	$\TGraph = \SGraph + \UGraph$
	`\UGraph`	$\UGraph = \TGraph - \SGraph$
	`\IGraph`	The IHX relation: $\IGraph = \HGraph - \XGraph$
	`\HGraph`	$\HGraph = \IGraph + \XGraph$
	`\XGraph`	$\XGraph = \HGraph - \IGraph$
	`\YGraph`	The AS relation: $\YGraph + \TwistedY = 0$
	`\FlippedYGraph`	The w-vertices: $\{\YGraph, \FlippedYGraph\}$
	`\TwistedY`	$\TwistedY = -\YGraph$
	`\ThetaGraph`	$Z(\ThetaGraph) = \nu^{1/2} \otimes \nu^{1/2} \otimes \nu^{1/2}$
	`\dumbbell`	
	`\wiggle`	$Z^{\text{naive}}(\wiggle) = \nu^{-1}$
	`\stonehenge`	The Stonehenge pairing $\langle D, K\rangle_{\stonehenge}$
	`\inup`	$\begin{matrix} X \\ \inup \\ x \end{matrix}$
	`\actsonleft`	G acts on X on the left: $G \actsonleft X$
	`\actsonright`	G acts on X on the right: $X \actsonright G$
	`\isotopic`	
	`\horizontalchord`	$Z^u(\overcrossing) = \exp(\horizontalchord)\overcrossing$
	`\rightarrowdiagram`	$Z^w(\overcrossing) = \exp(\rightarrowdiagram)\overcrossing$
	`\leftarrowdiagram`	$Z^w(\undercrossing) = \exp(-\leftarrowdiagram)\undercrossing$
	`\cappededge`	$\mathcal{A}^w(\cappededge)$
	`\upcap`	In $\mathcal{A}^w(\upcap)$, only wheels survive
	`\downcap`	$\downcap(D)$ cups the bottoms of the strands of D
	`\doubletree`	The $\doubletree$ map is key to associators and Z^w.

Symbol	LaTeXcommand	Usage example
◹	`\uppertriang`	◹ $\subset gl_n$ represents the upper triangular matrices.
◺	`\lowertriang`	◺ $\oplus$ ◹ $= gl_n \oplus \mathfrak{a}_n$.
Ⓤ	`\OU`	Ⓤ means Over then Under.
🇨🇦	`\CanadianFlag`	`Canad$\overset{\CanadianFlag}{\text{a}}$`: Canadă
□	`\dbnframe`	`\hbox to 0pt{$\slashoverback$}$\dbnframe$`: ⊠

5. Modifying `dbnsymb`

The symbols in `dnsymb` were all drawn using `xfig`, an X-windows drawing program, and then converted to metafont using `fig2dev` (a standard companion program to `xfig`) assisted by a simple `perl` script that I wrote.

To add new symbols or create your own symbol font, follow the following steps:

- Pick a new name for your font or addition; I would much prefer that you don't reuse the name `dbnsymb`. For the sake of concreteness, I will assume below that the name you have picked is "`dptsymb`".
- Download the `perl` script `makefont`, save it, and make it executable on your machine.
- Create a directory for the `xfig`-generated `.fig` files containing the symbols (for the sake of concreteness, let's call this directory `figs`). You can start with an empty `figs` directory or start with the `.fig` files used for the creation of `dbnsymb` by downloading, uncompressing and unpacking the file `figs.tar.gz`.
- Use `xfig` to draw your favorite symbols and to save them in the directory `figs`. You should fit your drawing within the 4in by 4in rectangle bounded by the horizontal and vertical 1in and 5in lines on the `xfig` canvas. The `dbnsymb` symbol `\dbnframe` (□) is precisely that rectangle; if you wish, you can extract the file `figs/040dbnframe.fig` from `figs.tar.gz` and use it as your guide. When saving a symbol in the directory `figs`, use the file name format `figs/nnnxxxxxx.fig`, where "`nnn`" is the 3-digit decimal character code you wish to use for that symbol (0–255), and the arbitrary length string `xxxxxx` is that symbol's name.
- Run the script `makefont` to create the files `dptsymb.mf` and `dptsymb.sty` (in the current working directory) by typing "`makefont -fn dptsymb -s figs`".
- You are done. Use the files `dptsymb.mf` and `dptsymb.sty` as if they were the files `dbnsymb.mf` and `dbnsymb.sty` of Section 2.

The script `makefont` has an additional optional parameter, `-f2m_opts` *filename*, that may contain symbol by symbol options for `fig2dev`. See the manual page for `fig2dev` and the options file `dbnsymb.f2m-opts` used for the creation of `dbnsymb`.

6. Acknowledgement

I wish to thank Dylan P. Thurston for his comments, suggestions and extra symbols. The base for the Canadian flag symbol 🇨🇦 came from the Xfig Flag Library.

7. Revision History

March 3, 2020: ⅄ added.
September 29, 2019:)(added.
April 1, 2017: Ⓤ added.
January 28, 2017: ◹ and ◺ added.
October 8, 2015: ↓ added.
January 27, 2014: ⊢⊣ added.
August 12, 2013: Minor tweaking.
November 30, 2011: ꝏ added.
May 29, 2010: ↑ added.
September 25, 2009: ⌧ and ⌧ added.
April 19, 2009: ↾ added.
November 28, 2008: ⊂ and ⊃ added.
November 12, 2008: ↦ and ↤ added.
September 25, 2008: ⌧ and ⌧ added.
August 22, 2008: ✕ added.

October 29, 2003: Canadä added!
October 27, 2003: Move to Toronto, some new symbols.
November 11, 2001: Some new symbols.
October 21, 2001: Some new symbols.
March 22, 2001: Bigger sized symbols in Section 4 in the html version.
January 25, 2001: Some new symbols.
May 18, 2000: Some new symbols, sizes adjusted so that $\square \simeq \square$ (`$\dbnframe\simeq\square$`).
May 7, 2000: Minor modifications and some extra symbols added.
April 26, 2000: Minor modifications.
April 25, 2000: Added "full mirror" download option.
April 24, 2000: Added a few symbols and Sections 5, 6 and 7 and made a few minor modifications.
March 19, 2000: First version posted.

Department of Mathematics, University of Toronto, Toronto Ontario M5S 3G3, Canada
Email address: `drorbn@math.toronto.edu`
URL: `http://www.math.toronto.edu/~drorbn`